ASTRONOMY AND ASTROPHYSICS

A European Journal

Volume 22 1973

Published by Springer-Verlag Berlin · Heidelberg · New York
on behalf of the Board of Directors

Astronomy and Astrophysics A European Journal

Board of Directors

Chairman: A. Blaauw (ESO)
Vice Chairman: H. Elsässer (Germany)
Secretary and Treasurer: J. L. Steinberg (France)
Y. Andrillat (France)
L. Biermann (Germany)
H. G. van Bueren (The Netherlands)
H. C. van de Hulst (The Netherlands)
J. Kovalevsky (France)
P. O. Lindblad (Sweden)
A. Reiz (Denmark)
L. Rosino (Italy)
E. Schatzman (France)
G. Setti (Italy)
U. Steinlin (Switzerland)
A. Unsöld (Germany)
A. G. Velghe (Belgium)

Editors-in-Chief 1973-75

J. Heidmann
Observatoire de Meudon
92190 Meudon (France)

S. R. Pottasch
Kapteyn Astronomical Institute
P.O. Box 800
Groningen 8002 (The Netherlands)

Editing Secretaries

Mrs. F. Axisa
Miss B. Perche
Mrs. C. E. Kremer

Board of Editors

K. Bahner (Heidelberg)
J. E. Baldwin (Cambridge)
B. Baschek (Heidelberg)
W. Becker (Basel)
E. J. Blum (Meudon)
K. H. Böhm (Seattle)
J. Borgman (Roden)
E. M. Burbidge (Hailsham)
G. M. Clemence (New Haven)
O. J. Eggen (Woden)
W. Fricke (Heidelberg)
V. L. Ginzburg (Moscow)
M. Hénon (Nice)
J. T. Jefferies (Honolulu)
F.D. Kahn (Manchester)
F. J. Kerr (Maryland)
K. O. Kiepenheuer (Freiburg)
R. Kippenhahn (Göttingen)
H. van der Laan (Leiden)
G. Larsson-Leander (Lund)
P. Ledoux (Liège)
J. Lequeux (Meudon)
L. Mestel (Manchester)
P. G. Mezger (Bonn)
B. Morando (Paris)
F. Pacini (Frascati)
B. E. J. Pagel (Hailsham)
L. Plaut (Groningen)
F. Praderie (Meudon)
M. S. Roberts (Green Bank)
M. Schmidt (Pasadena)
F. Spite (Meudon)
A.B.Underhill (Goddard Space Flight Center)
H. Van Regemorter (Meudon)
L. Woltjer (New York)
J. P. Zahn (Nice)
C. Zwaan (Utrecht)

The exclusive copyright © for all languages and countries, including the right for photomechanical and any other reproduction, also in microform, is vested in European Southern Observatory (ESO).
The use of registered names, trademarks, etc. in this publication does not imply, even in the absence of a specific statement, that such names are exempt from therelevant protective laws and regulations and therefore free for general use.

Springer-Verlag · Berlin · Heidelberg · New York
Printed in Germany
Printers: Brühlsche Universitätsdruckerei, Giessen

Volume 22 1973

Contents

Stars and Stellar Evolution

TRIMBLE, V., PACZYŃSKI, B.: Helium Red Giants 9

DEMARQUE, P., MENGEL, J.G.: Evolution from the Main Sequence to the Helium Flash for Population II Stars 121

GROVER, S.D., SINGH, S., TANDON, J.N.: The Hydromagnetic Oscillations and Stability of Self-Gravitating Masses. III. Magnetic Polytropes 133

COWLEY, A., GUGULA, E.: Cyclic Variations of the Be Star β^1 Monocerotis 203

STIFT, M.J.: Photometric Investigations of Magnetic Stars 209

LESH, J.R., AIZENMAN, M.L.: The Spectral Classification of the β Cephei Stars and Their Location in the Theoretical Hertzsprung-Russel Diagram 229

BREINHORST, R.A., PFLEIDERER, J., REINHARDT, M., KARIMIE, M.T.: On the Determination of Minimum Times of Light Curves 239

BREGER, M.: Short-Period Variability of B, A and F Stars. VI. New Delta Scuti Stars in Selected Regions 247

FARAGGIANA, R.: Spectral Variations of 53 Cam (AX Cam) 265

KODAIRA, K.: Revised Chemical Abundances of Four Population-II A-Type Stars 273

GREENE, T.F., PERRY, J., SNOW, T.P., WALLERSTEIN, G.: Atmospheric Abundances in the Carbon Star HD 156074 293

HARMANEC, P., KOUBSKÝ, P., KRPATA, J.: Properties and Nature of Shell Stars. 3. Periodic Radial-Velocity Changes of 4 Herculis 337

NAVACH, C., LEHMANN, M., HUGUENIN, D.: Feasibility of UV Astronomy by Balloon-Borne Observations. I. Stellar Spectrophotometry 361

NAVACH, C.: Feasibility of UV Astronomy by Balloon-Borne Observations. II. Stellar Gradients in the Near Ultraviolet 371

PERCY, J.R.: A Photometric Study of 21 Comae Berenices 381

BAAN, W.A., TREVES, A.: On the Pulsation of X-Ray Sources 421

FALIPOU, M.A.: The Metallic-Line Star 15 UMa and the F 5 V Star 5 And. 445

Galactic Structure, Stellar Dynamics, Interstellar Matter

MINN, Y.K., GREENBERG, J.M.: The Kinematical Distribution of Dark Clouds Surveyed in the 4830 MHz H_2CO Line 13

DOPITA, M.A., GIBBONS, A.H., MEABURN, J.: Measurements of the Electron Temperatures in M42 from the Profiles of Hα, [N II], Hβ and [O III] 33

CHU-KIT, M.: Galactic Structure from Observations of Interstellar Calcium Lines. I. Analysis of the Radial Velocities 69

CRÉZÉ, M.: Galactic Differential Rotation Derived from the Radial Velocities of Some Population I Objects 85

HARDORP, J., LÜBECK, K., STEPHENSON, C.B.: Carbon Stars in the Northern Milky Way 129

VERSCHUUR, G.L.: High-Velocity Clouds and "Normal" Galactic Structure 139

BECKER, W., FANG, Ch.: Three-Colour Photometry of a Field in the Galactic Anticentre Section near NGC 1664 187

HERSPERGER, Th.: Three-Colour Photometry in a Field in the Direction of the Galactic Anticentre near M 35 195

WINK, J.E., ALTENHOFF, W.J., WEBSTER, W.J., Jr.: Interferometer Observations of W3 (OH) at 2.695 GHz and 8.085 GHz 251

Stasinska, G.: On the Presence of H_2 Molecules inside Neutral Globules Imbedded in H II Regions 355

Biermann, P.: Density Shock Waves Driven by Star Formation – a Mechanism 407

Aubry, D., Kazès, I.: H I Absorption in the Galactic Center Region and between Galactic Longitudes 350° and 359° 413

Froeschlé, C., Scheidecker, J.-P.: Numerical Study of a Four-Dimensional Mapping. II. 431

Galaxies, Cosmology

Huchtmeier, W.: The Distribution of Neutral Hydrogen and the Velocity Field of the Galaxy NGC 3109 27

Eneev, T.M., Kozlov, N.N., Sunyaev, R.A.: Tidal Interaction of Galaxies 41

Huchtmeier, W.: A Neutral Hydrogen Survey of the Galaxy M 33 $_{\odot}$ II. Distribution and Kinematics of the Neutral Hydrogen 91

Rogstad, D.H., Shostak, G.S., Rots, A.H.: Aperture Synthesis Study of Neutral Hydrogen in the Galaxies NGC 6946 and IC 342 111

Chiao, R.Y., Reinhardt, M.: The Distribution of the Mass-to-Luminosity Ratio of Spiral and Irregular Galaxies 257

Bottinelli, L., Gouguenheim, L., Heidmann, J.: Neutral Hydrogen in Markarian Galaxies 281

Seaquist, E.R.: Circular Polarization Studies of Selected Compact Sources at 3240 MHz 299

Collin-Souffrin, S., Alloin, D., Andrillat, Y.: A Discussion of the New Variations Observed in the Nucleus of the Seyfert Galaxy NGC 3516 343

Bergeron, J., Salpeter, E.E.: Models for Extragalactic Objects with Very High IR and X-Ray Luminosity 385

Mirabel, I.F., Turner, K.C.: A Search for Neutral Hydrogen Remnants of Strong Tidal Disruption of the Small Magellanic Cloud 437

Rosino, L., Bianchini, A.: Observations of Hubble-Sandage Variables in M 31 and M 33 453

The Sun

Harvey, C.C., Aubier, M.G.: Landau Damping of Type III Solar Radiobursts 1

Lemaire, P., Skumanich, A.: Magnesium II Doublet Profiles of Chromospheric Inhomogeneities at the Center of the Solar Disk 61

Boland, B.C., Engstrom, S.F.T., Jones, B.B., Wilson, R.: The Heating of the Solar Corona. I. Observation of Ion Energies in the Transition Zone 161

Cowley, Ch., R., Toney, J.: Saturation Effects in Fraunhofer Lines of Neutral Iron 441

Planetary System

Lecacheux, J., Combes, M., Vapillon, L.: The β Scorpii Occultation by Jupiter. I. The Jovian Diameter 289

Dumont, R., Sánchez-Martinez, F.: Zodiacal Light Photometry off the Ecliptic in Quadrature and in Opposition with the Sun 321

Celestial Mechanics and Astrometry

Calame, O.: Determination of Lunar Libration by Laser Moon-Ranging 75

Débarbat, S., Grudler, P.: Observations of Jupiter with Danjon Astrolabes in 1965, 1966, 1967 81

Szebehely, V.: Families of Isoenergetic Escapes and Ejections in the Problem of three Bodies 171

Rapaport, M.: On the Analytical Theory of Saturn's Satellites, Encelade-Dione 179

Débarbat, S.: Observational Studies of Jupiter during the Years 1965, 1966, 1967 329

Dejaiffe, R.J.: Frequency of Star Eliminations in the Meridian Catalogues Constitutive of the Melchior-Dejaiffe ILS Stars Catalogue 425

Instruments and Data Processing

Seboldt, W.: Application of the Theory of Radiative Transfer to Stellar Images in the Photographic Emulsion 217

Letters to the Editor

HULSBOSCH, A.N.M., OORT, J.H.: Note on Verschuur's Article on High-Velocity Clouds and "Normal" Galactic Structure 153

Research Notes

KANDEL, R.S.: Note on Terminology – Specific Luminosity 155

ALBADA, G.D. VAN: Proper Motion of BD + 16° 516 157

ALLEN, D.A., PORTER, F.C.: Infrared Photometry of Southern Wolf-Rayet Stars 159

EKERS, R.D.: Upper Limits to the 21 cm Continuum Radiation from Two Magnetic White Dwarfs 309

ARNOULD, M.: Some Comments about the ^{176}Lu-^{176}Hf Pair 311

DÜRBECK, H.: Photographic Observations of the Supernova 1971 in NGC 5055 317

BATES, R.H.T., GOUGH, P.T., NAPIER, P.J.: Speckle Interferometry Gives Holograms of Multiple Star Systems 319

ROSINO, L., BIANCHINI, A.: Discovery of Five Novae in Messier 33 and a Supernova in a Field Galaxy 461

CIATTI, F.: The Infrared Spectrum of the Supernova in NGC 5253 465

GENDEREN, A.M., VAN: A Rectification of Five-Colour Photometry of LMC Supergiants 467

D'ODORICO, S., RUBIN, V.C., FORD, W.K., Jr.: Line Intensities and Radial Velocities for 12 Planetary Nebulae 469

WILSON, W. J., RIEGEL, K.W.: Two New Main-Line OH/IR Stars 473

KEGEL, W.H.: Plasma Effects and the Acceleration of Charged Particles in Pulsar Fields 475

Erratum

KRUIT, P.C., VAN DER, OORT, J.H., MATHEWSON, D.S.: The Radio Emission of NGC 4258 and the Possible Origin of Spiral Structure 479

Abstracts of Articles which will be Published in A. A. Suppl. 8

WEAVER, H., WILLIAMS, D.R.W.: The Berkeley Low-Latitude Survey of Neutral Hydrogen 481

WILLIAMS, D.R.W.: Studies of Four Regions for Use as Standards in 21-cm Observations 481

Abstracts of Articles which will be Published in A. A. Suppl. 9, No. 1

FOGH OLSEN, H.J., JENSEN, P., KNUDSEN, T.: Positions of 2246 Stars Brighter than 11.0 vis. mag. 481

HUMPHREYS, R.M.: Spectroscopic and Photometric Observations of Luminous Stars in Carina-Centaurus (l=282–305°) 481

VOGT, N., MOFFAT, A.F.J.: Southern Open Star Clusters. II. *UBV*-Hβ Photometry of 11 Clusters between Galactic Longitudes 259° and 280° 482

HUBERT, H.: Variation or Disappearance of the Emission in 8 Be Stars 482

Erratum to the Abstracts of Articles which have been Published in A. A. Suppl. 7, No. 4 (Vol. 21, p. 328 (1972))

LINDOFF, U.: The Old Open Clusters NGC 6819 482

(Indexed in Current Contents)

Author-Index

Aizenman, M.L. 229
Albada, G.D. van 157
Allen, D.A. 159
Alloin, D. 343
Altenhoff, W.J. 251
Andrillat, Y. 343
Arnould, M. 311
Aubier, M.G. 1
Aubry, D. 413

Baan, W.A. 421
Bates, R.H.T. 319
Becker, W. 187
Bergeron, J. 385
Bianchini, A. 453, 461
Biermann, P. 407
Boland, B.C. 161
Bottinelli, L. 281
Breger, M. 247
Breinhorst, R.A. 239

Calame, O. 75
Chiao, R.Y. 257
Chu-Kit, M. 69
Ciatti, F. 465
Collin-Souffrin, S. 343
Combes, M. 289
Cowley, A. 203
Cowley, Ch.R. 441
Crézé, M. 85

Débarbat, S. 81, 329
Dejaiffe, R.J. 425
Demarque, P. 121
D'Odorico, S. 469
Dopita, M.A. 33
Dumont, R. 321
Dürbeck, H. 317

Ekers, R.D. 309
Eneev, T.M. 41
Engstrom, S.F.T. 161

Falipou, M.A. 445
Fang, Ch. 187
Faraggiana, R. 265
Ford, W.K., Jr. 469
Froeschlé, C. 431

Genderen, A.M., van 467
Gibbons, A.H. 33
Gough, P.T. 319
Gouguenheim, L. 281
Greenberg, J.M. 13
Greene, T.F. 293
Grover, S.D. 133
Grudler, P. 81
Gugula, E. 203

Hardorp, J. 129
Harmanec, P. 337
Harvey, C.C. 1
Heidmann, J. 281
Hersperger, Th. 195
Hubert, H. 482
Huchtmeier, W. 27, 91
Huguenin, D. 361
Hulsbosch, A.N.M. 153
Humphreys, R.M. 481

Jensen, P. 481
Jones, B.B. 161

Kandel, R.S. 155
Karimie, M.T. 239
Kazès, I. 413
Kegel, W.H. 475
Knudsen, T. 481
Kodaira, K. 273
Koubský, P. 337
Kozlov, N.N. 41
Krpata, J. 337
Kruit, P.C. van der 479

Lecacheux, J. 289
Lehmann, M. 361
Lemaire, P. 61
Lesh, J.R. 229
Lindoff, U. 482
Lübeck, K. 129

Mathewson, D.S. 479
Meaburn, J. 33
Mengel, J.G. 121
Minn, Y.K. 13
Mirabel, I.F. 437
Moffat, A.F.J. 482

Napier, P.J. 319
Navach, C. 361, 371

Olsen, H.J.F. 481
Oort, J.H. 153, 479

Paczynski, B. 9
Pâquet, P. 329
Percy, J.R. 381
Perry, J. 293
Pfleiderer, J. 239
Porter, F.C. 159

Rapaport, M. 179
Reinhardt, M. 239, 257
Riegel, K.W. 473
Rogstad, D.H. 111
Rosino, L. 453, 461
Rots, A.H. 111
Rubin, V.C. 469

Salpeter, E.E. 385
Sánchez-Martinez, F. 321
Scheidecker, J.-P. 431
Seaquist, E.R. 299
Seboldt, W. 217
Shostak, G.S. 111
Singh, S. 133
Skumanich, A. 61
Snow, T.P. 293
Stasinska, G. 355
Stephenson, C.B. 129
Stift, M.J. 209
Sunyaev, R.A. 41
Szebehely, V. 171

Tandon, J.N. 133
Toney, J. 441
Treves, A. 421
Trimble, V. 9
Turner, K.C. 437

Vapillon, L. 289
Verschuur, G.L. 139
Vogt, N. 482

Wallerstein, G. 293
Weaver, H. 481
Webster, W.J., Jr. 251
Williams, D.R.W. 481
Wilson, R. 161
Wilson, W.J. 473
Wink, J.E. 251